Waterwise Response to Energy Efficiency Partnership for Homes and DECC Call for Evidence on

Green Deal – Costs and Benefits of Energy Efficiency Measures

April 2011

Overview

Introduction

The Call for Evidence sets out the aims of the Green Deal to transform the energy efficiency of British properties and to use the "advance advice" to give customers a wider range of information about steps they can take to improve the sustainability of their homes.

In this submission Waterwise sets out why it is important to include water-efficient taps and showers in the Green Deal to meet both these aims – cost-effective carbon savings from homes and effective behaviour change to deliver both carbon savings and wider sustainability.

Waterwise welcomes the inclusion of water efficiency in the Green Deal, as set out in the National Infrastructure Plan published in October 2010, and the inclusion of water-efficient taps and showers in the Call for Evidence.

Specifically, in this document Waterwise sets out why water efficiency should be included in both the "Surveyor" and the "Installer" phases of the customer journey under the Green Deal, in terms of not only the specific costs and benefits on the Green Deal balance sheet but also the wider aims of DECC and the Coalition Government, on carbon and water savings.

Meeting Green Deal aims through the inclusion of water efficiency

The Green Deal will include measures such as insulation which can cost many thousands of pounds per household - including water efficiency (showers and taps) would only cost on average £50 per household and would save 300kWh per household per year. A retrofit of taps and showers under the Green Deal would payback on energy bills in the third year, and for homes which were also metered for water (currently one third of homes in England, a quarter in Wales, and a negligible number in Scotland), within one year. This places water efficiency measures firmly within the remit of the Golden Rule, which states that the repayment cost of measures installed must not exceed the estimated annual energy savings

on fuel bills over the financing period, and will determine which measures attract Green Deal finance.

If a toilet retrofit were also included (to reduce flush volume), at cost to the householder (around £10) or by the water company at no upfront cost to the householder, homes metered for both energy and water would payback within the first year. (A formal link with the regulatory framework for water in Great Britain, for example with the water efficiency targets in England and Wales and the water efficiency duty in Scotland, could help fund the cold water efficiency element of the Green Deal - the toilet retrofit.)

These figures are drawn from Waterwise's respected Evidence Base for Large-scale Water Efficiency, supported and co-funded by Defra, Ofwat, the Environment Agency and DCLG. The Evidence Base was used by Ofwat and the water companies during the last periodic review of water prices in England and Wales. The Evidence Base is the most comprehensive analysis of work to date on the costs and benefits of water efficiency measures, drawing on data from thousands of homes.

The payback periods for water efficiency measures compare favourably with the payback time for energy efficiency measures in the Green Deal – and in practice would be less as Waterwise has costed them here at the rate of installation charged by a fully-qualified plumber, whilst in fact in Waterwise's own Tap into Savings partnership programme non-plumbers have been trained in less than a day (up to one week maximum, depending on existing skills levels) to carry out such measures in homes. Economies of scale on installation costs (hourly rates) would also result. For water efficiency measures, the products cost so little, relatively speaking (around £27 for showers and taps and around £37 if the toilet retrofit is included), that the primary cost is that of the visit itself, so reducing this through dedicated training and economies of scale reduces payback times even further.

Table 1 summarises the payback times, and water and energy savings at household level, for including water efficiency measures in the Green Deal – further detail can be found on pages 7 to 10 and in Annex 2:

Table 1

Measure	Scenario 1 – retrofit of showers and taps	Scenario 2 – retrofit of showers, taps and toilet
Cost of products per household	£27.50	£37.50
Installation time per household	20 mins	30 mins
Installation cost per household	£20	£30
Cost per scenario per household (products and installation)	£47.50	£67.50
Energy savings per year	300 kWh	300 kWh
Water savings per year	$7.4m^3$	$15m^3$
Energy bill savings per year	£26	£26
Water bill savings (metered) per year	£25	£51
Payback on energy	Within 3rd year	Within 3rd year
Payback on energy and water	Within 1 year	Within 1 year

A link to water metering in homes could be used to increase the financial savings from water efficiency by reducing water bills as well as energy bills – and as such could be used to enhance the attraction of the Green Deal package to the individual householder.

A modular approach could be developed so that Green Deal suppliers can easily slot the water efficiency element into their household offer. Training for installers on installation and the advice given alongside this could be provided and accredited – depending on the existing level of skill, this need only take from half a day to a maximum of week. Information, literature and training on water efficiency advice for both the surveyor and supporting phone line operatives could also be stand-alone. The same is true of the products themselves, which cost between £10 (tap inserts only) and around £35 (showers, taps and toilets), and could be funded as a module by a provider of the water element of a Green Deal package, such as a water company.

Meeting wider DECC and Government aims through water efficiency in the Green Deal

Mitigating climate change

Shower and tap retrofit devices offer a very cost-effective way to cut carbon and increase wide-scale public engagement on environmental issues, and have additional water-saving benefits. They help deliver carbon savings (as well as wider Coalition Government goals such as adaptation to climate change, and development of the green economy).

Wasting less water in homes and businesses can help meet the UK's legally binding goals of a reduction in greenhouse gas emissions of 34% by 2020 and 80% by 2050. Heating water in homes for cooking, personal washing and cleaning produces 5% of the UK's greenhouse gas emissions and a quarter of CO_2 emissions from homes - it is the second biggest use of energy in homes, after space heating, and before gadgets and appliances. So wasting less hot water in homes - through more efficient fixtures and fittings and more efficient use of hot water from taps and showers by people - can immediately impact on carbon targets. Wasting less hot and cold water will reduce the carbon footprint of the water industry, which would as a result need to pump and treat less water and wastewater (in turn making the sector more resilient to climate change). The water industry produces 1% of total UK greenhouse gas emissions, with Scottish Water Scotland's largest user of electricity. The 5% from hot water in homes and the 1% from the water industry's own processes are, combined, broadly equivalent to the contribution of aviation to total UK greenhouse gas emissions.

The potential for addressing carbon emissions from homes through hot water efficiency measures is not being fully realised. CERT is beginning to be used to fund joint water and energy retrofitting projects, but there are barriers to this being mainstreamed, including the application (erroneously, in Waterwise's view) of the "additionality" principle and uncertainty over the continued inclusion of how water-saving devices in the final 18 months of CERT, to December 2012.

It is proven that water-saving shower devices are a highly cost-effective way of reducing carbon. They have wide application and can be used in the majority of hard-to-treat homes.

Measures to make showers more water-efficient are designed to reduce the consumption of heated water. This water will have been heated predominantly by gas (70% of domestic properties use gas as the main fuel for heating and hot water) and is therefore outside the traded obligation. Shower devices will always save both energy and carbon (as well as water), and not many devices are designed to do this. This makes showers particularly important in delivering DECC goals, which include reducing emissions in the non-traded sector.

Waterwise calculations (see Annex 1) show that energy savings from including showers and taps in the Green Deal in 10.6 million homes in Great Britain on a Britain-wide basis would be 3.2 GWh per year and the annual carbon emissions savings at GB level would be approximately 583,000 tonnes of CO_2.

Annex 1 sets out Waterwise's assumptions in reaching this figure for the total number of homes in Great Britain with showers suitable for retrofitting. Broadly speaking, Waterwise research suggests that approximately 80% of households have a shower and about 50% of these own electric showers, so about 40% of households own mixer showers and can be

retrofitted with water-efficient showerheads or shower inserts (from Waterwise's report The Water and Energy Implications of Bathing and Showering Behaviours and Technologies – April 2009). In fact this is a conservative estimate, and it remains the case that all 26.5 million homes in Britain could have water efficiency measures undertaken on their taps.

Energy savings on a Britain-wide basis from including showers, taps and toilets in the Green Deal (with the toilet element funded by the householder or the water company) in 10.6 million homes in Great Britain would be 3.2 GWh per year and the annual carbon emissions savings at GB level approximately 583,000 tonnes of CO_2 (the reduced toilet flush volume would not save any extra carbon or energy at household level).

The carbon and energy savings outlined above for both scenarios occur are at household level, but there would be related carbon and energy savings at water industry level through reduced pumping and treating of water and wastewater.

Analysis from Waterwise's Evidence Base, discussed above, based on data from water company retrofitting programmes, shows that inclusion of hot water efficiency measures (showers and taps) in the Green Deal package can deliver carbon and energy savings cost-effectively. The most-up-to-date research (due for publication in April 2011) shows that these savings (through household water savings) are sustained - only reducing by around 5% over three years (contrary to previous assumptions.)

In the Introduction this Evidence sets out that water efficiency should be included in both the "Surveyor" and the "Installer" phases of the customer journey under the Green Deal, in terms not only of the specific costs and benefits on the Green Deal balance sheet but also the wider aims of DECC and the Coalition Government, on carbon and water savings.

Including both water efficiency products and installation (at either of the visits – their installation is basic and takes less than half an hour) and advice maximises the carbon savings, and therefore the energy bill savings. Advice and information alone (via the surveyor visit only) is a less reliable way to save water than a combined approach, because so much depends on both the quality of the advice given and existing behavioural triggers which can't necessarily be overcome in untailored, one-off advice. For example, in the Waterwise-led Tap into Savings retrofitting and behaviour change partnership of 7,500 homes in England, residents who had no products installed during the home visit still reported thinking about and using water differently, and it is arguable that this would not have been the case if technology was not used in the home to engage the resident. We also know from evidence that people make better use of water devices if their use is discussed and dsmonstrated, and behaviour change advice given, alongside installation. Tap into Savings data is currently being analysed but suggests that only half of residents read the materials left with them, which is why the home visits concentrated on the installer "showing and talking" during the visit, rather than expecting information to be read later.

Once every home in the UK has been insulated, through CERT, the Green Deal, ECO (the proposed successor to CERT) and other measures, there will be remaining carbon emissions from homes in terms of heating water which need to be addressed. It would not be cost-effective to undertake these programmes sequentially rather than in parallel – nor would it

maximise the impact of nudge on customer behaviour, because one approach is more likely to be welcomed by householders than two separate ones for a home visit, by for example an energy company and then a water company several years later.

Finally, households will save money through wasting less hot water. Waterwise research shows that the average UK household could save up to £100 a year on its energy bills from wasting less hot water in baths, showers and taps – £76 a year just by replacing a daily bath with a three-minute shower. This will help deliver the Coalition Government's commitment to increase households' control over their energy costs. A third of homes in England and a quarter in Wales are already metered for water, and half will be by 2015 - through wasting less water those homes will also see an immediate reduction in their water bills.

Adapting to climate change

Wasting less hot and cold water will not only tie in with the Coalition Government's commitment to use a wide range of levers to cut carbon emissions. It will also help deliver the commitment set out in the Coalition Programme for Government to deliver greater water efficiency and affordability (through reform of the water industry), and underpin adaptation planning, including addressing issues of water scarcity.

Every sector of the UK economy is dependent on water. In a 2005 report, the National Audit Office stated that "Many of these industries would not be possible without the use of water. To replace a supply of one million litres of water a day would typically cost about £2 million ..... Clearly, water use is of such importance that its value to the economy as a whole is incalculable." The Cave Review of Competition and Innovation in Water Markets (which Defra Ministers are committed to examining the conclusions of) points out that, although the cost of the abstraction licensing regime - drawing water for supply - is relatively low (around £124 million in 2007), the value of water in the economy is significantly greater.

Indeed, water efficiency measures across the board - hot and cold - have an important role in their own right in the UK's programme to adapt to climate change, not just as a cost-effective means to reduce carbon emissions. Some areas of England are already classified by the Environment Agency as seriously water-stressed, and it is known that in coming years there will be more people and less water, so the available water will need to go further, through water-efficient homes, buildings, and people. In addition, the Coalition Government is committed to publishing a White Paper on reform of the water sector to ensure more efficient use of water (and the protection of poorer households), by June 2011, and to introducing legislation by 2012.

Measures to make showers and taps more efficient can be very easily included in the Green Deal Surveyor and Installer visits, as is set out above. The water savings from undertaking such steps in every home with a shower suitable for retrofitting would be 78,440 ML per year - enough to supply the water for 600,000 households. The water savings at household level are set out elsewhere in this Evidence. Furthermore, including a toilet retrofit in the Green Deal, to reduce flush volume, funded at cost by the householder (£10 for the kit and £10 for installation) or by the water company at no upfront cost to the householder, would maximise the carbon and energy (at household and GB level) and water savings. The water

savings from a retrofit of showers, taps and toilets in all the homes in Britain with showers suitable for retrofitting would be 159,000 ML per year - greater than the entire reservoir storage for the South West Water region.

In Scotland, Scottish Water has a duty to "promote water conservation and water-use efficiency" as a result of the Climate Change (Scotland) Act 2009, and in England and Wales all water companies have water efficiency targets to meet, set by Ofwat. A link between these and the Green Deal could help fund a cold water (toilet) element of the Green Deal.

The reference in the National Infrastructure Plan to the Green Deal explicitly refers to driving water efficiency, in the following commitment: "*Meet the water needs of a growing population in a UK where rainfall is likely to be both more intense and less frequent by…….. encouraging the efficient use of water in homes and businesses including through delivering joint energy and water savings within the Green Deal"*.

Detailed evidence on costs and benefits

Water-efficient taps and showers – costs and benefits

In this section Waterwise presents the costs and benefits of including water-efficient taps and showers in the Green Deal - both during the installer visit and the surveyor visit. The costs and benefits and payback time are broken down by household but also presented at GB level. Waterwise has developed two scenarios for this section, one on showers and taps alone, and the second including a toilet retrofit as part of the package, either funded by the householder (at a cost of between £10 and £20 with the associated water bill savings outlined above) or provided at no extra cost to the householder by the water company.

The costs and benefits below and the attached spreadsheets (found at Annex 2) are all based on hard evidence from Waterwise's Evidence Base for Large-scale Water Efficiency in Homes, described on page 2, which draws on actual data from retrofitted homes in water company projects.

The spreadsheets contain two scenarios for which the payback time and net present value (NPV) over 25 years are calculated. The two scenarios are a retrofit of showers and taps to make them more water-efficient, and a retrofit of showers, taps and toilets. The calculation of energy - and water - savings and payback for each scenario is framed from the customer's perspective.

There are a number of assumptions made in the spreadsheet which are drawn from Waterwise's Evidence Base for Large-scale Water Efficiency in Homes (see page 2) - it is possible to modify many factors to influence payback time, including water savings, the level of carbon emissions and energy savings. It is common practice for this kind of assessment to include assumptions, and the Green Deal itself has some underlying assumptions, including for example on the longevity of energy savings from loft insulation. The assumptions used here are detailed in the third and fourth tabs in Annex 2.

The cost of installation used in the calculations is typical for a plumber (£60 per hour), although the installation of the water-efficient products described is simple and would not require a fully trained plumber. Even if plumbers are used, Waterwise's partnership retrofitting project in Swindon with WWF and Thames Water, which is paying plumbers £40 an hour, illustrates that the payback times could be reduced considerably as economies of scale kick in. Options for installation include training those who are visiting the homes to install insulation to provide them with the skills to carry out water efficiency retrofitting (which would reduce costs - hourly rates - in the scenarios in Annex 2), and training the first visitor to homes as part of the Green Deal journey - the surveyor - to do so. The installation skills required to make taps and showers more water-efficient are basic, and training can be completed in a day or two, with installation itself only taking half an hour. In Coventry, the Waterwise-led retrofitting and behaviour change partnership Tap into Savings has trained new installers to visit homes, and calculates that this can be undertaken for around £20 an hour.

Economies of scale would certainly result if joint water and energy home visits were carried out on a large scale, such as under the Green Deal. It is expected that the cost of products and of installation will decrease as the number of homes included increases.

Overall, Waterwise has calculated a payback time for the cost of products and installation, for a retrofit of showers and taps, of within one year for homes metered for energy only and within one year for homes metered for both energy and water. This payback illustrates clearly that water efficiency measures meet the Green Deal Golden Rule – and as has been pointed out above, it is likely to be reduced further in practice.

The scenarios set out below are of a retrofit of showers and taps (Scenario 1), and one which also includes a toilet (Scenario 2). A summary of the paybacks and savings can be found in Table 1.

Even though including a toilet in the water efficiency package of measures would not impact on a Green Deal household-level payback on energy bills, it could be funded by the water company or householder (at a cost of about £10) and would reduce bills for those homes metered for water, as well as help meet wider DECC and Coalition Government goals on climate change mitigation and adaptation, as set out earlier in this Evidence. Additional carbon and energy savings at GB level would result from the water company needing to pump and treat less water and wastewater: these would be doubled under Scenario 2 because of the inclusion of the toilet retrofit, which doubles the household water saving. Water metering improves the costs and benefits at household level - so water efficiency measures and installation of a water meter by the water company can be used as an incentive to the householder to take up the Green Deal package. In turn, the inclusion of water efficiency in the Green Deal can be used as an incentive for householders to switch to a water meter.

Scenario 1

This scenario, set out in the first spreadsheet in Annex 2, includes the retrofit of showers and taps only. This scenario was created specifically to feed into discussions on the Energy Bill and the Green Deal.

Overall payback can be calculated assuming water savings of 20 litres per property per day. This is based on the results achieved in a trial of 1000 homes included in Waterwise's Evidence Base (Anglian Water's Ipswich Trial), but an additional assumption based on the contribution of showers and taps to the original savings of 41 litres per property per day (which included a toilet retrofit) has been made: essentially showers and taps are assumed to account for 50 per cent of the water savings. A three-year payback on energy bills will be achieved, at a cost per property of £50.

The water efficiency measures can in practice be delivered for even less than £50 per property including products and installation. Below is an example of the products which could be installed and a cost estimate based on recent procurement:

1 Mira Eco showerhead – approx £10 per unit
5 tap inserts per household - £2.50 per unit
1 digital shower timer - £5.00 per unit
Cost of products = £27.50

Installation time – 20 minutes @ cost of £60/hour = £20

Overall cost of water retrofit = £47.50

Water savings (from which the energy savings are derived) – 20.4 litres per property per day, which amounts to 7.4m^3 of water saved in the first year.

Energy savings – 0.04 kWh per litre of water saved, which amounts to 300 kWh per household in the first year. It is assumed that gas is used to heat water in the home and an average price of £0.085/kWh has been used. The energy saving in the first year amounts to £26.

Carbon savings – 7.41g CO_2 per litre of water saved, with 55kg of CO_2 saved in the first year per home. The carbon is valued at £47 per tonne: the carbon data was calculated with guidance from DECC and presented in the February 2010 report of Waterwise's Evidence Base.

Payback time – within the third year based on energy savings alone, and within one year if metered for water and energy.

Scenario 2

This scenario includes the retrofit of showers, taps and toilets. The payback calculation for this scenario, set out in the second spreadsheet in Annex 2, takes into account the monetary benefit of water, energy and carbon emissions savings to calculate a net present value.

Overall, payback can be achieved within the third year on energy bills, and within the first year for homes metered for water and energy, assuming water savings of 41 litres per property per day, which were typically achieved in a trial of 1000 homes included in Waterwise's Evidence Base (Anglian Water's Ipswich Trial).

The water efficiency measures can in practice be delivered for less than £70 per property, including products and installation. Below is an example of the products which could be installed, and a cost estimate based on recent procurement:

1 dual-flush toilet conversion device per household – approx £10 per unit
1 Mira Eco showerhead – approx £10 per unit
5 tap inserts per household - £2.50 per unit
1 digital shower timer - £5.00 per unit
Cost of products = £37.50

Installation time – 30 minutes @ cost of £60/hour = £30

Overall cost of water retrofit = £67.50

Water savings (from which the energy savings are derived) – 41 litres per property per day, which amounts to 15m^3 of water saved in the first year.

Energy savings – 0.02 kWh per litre of water saved, which amounts to 300 kWh in the first year. It is assumed that gas is used to heat water in the home and an average price of £0.085 per kWh has been used. The household-level energy saving in the first year amounts to £26.

Carbon savings – 3.69g CO_2 per litre of water saved, with 55kg of CO_2 saved in the first year. The carbon is valued at £47 per tonne: the carbon data was calculated with guidance from DECC and presented in the February 2010 report of Waterwise's Evidence Base.

Payback time – within the first year based on water, energy and carbon emissions savings.

The carbon and energy savings per litre for this scenario are lower than those for the scenario which does not include a toilet retrofit, because the household-level carbon and energy saving is spread over a higher water saving (the toilet retrofit does not deliver carbon and energy savings within the home). Absolute energy and carbon savings at household level are the same in both scenarios.

Costs and benefits of behaviour-change measures

The Call for Evidence sets out that the Government is looking at how best to use the accredited, objective advice which is required in advance of the plan to give consumers a wider range of information about steps they can take to improve the sustainability of their homes.

Through the Tap into Savings retrofitting and behaviour change partnership led by Waterwise, and other Waterwise research, Waterwise has evidence of the most cost-effective way to undertake behaviour change on water efficiency, including when linked with energy efficiency. This data is in the process of being analysed and will be published in June 2011

SMEs

Wasting less hot water in workplaces through the Green Deal through more water-efficient taps, showers, dishwashers and washing machines would cut energy bills, and would meet the Golden Rule.

In addition, unlike homes, most UK businesses, schools, hospitals and other public sector buildings are metered for water. This means that if they waste less water - through "domestic" processes such as taps and showers, and dishwashers and washing machines, as well as in industrial processes such as cleaning and cooling - they will see immediate reductions in their water bills, as well as in their energy bills from heating (and wasting) less hot water. Following the arguments set out above for linking a toilet retrofit to the Green Deal for households, significant bill savings could be made by SMEs from making toilets and urinals water-efficient: for example, many workplaces still have urinals which flush constantly, but there are now UK-manufactured products which flush only when a sensor is triggered, or less frequently, or not at all.

The complexity of energy use in the business sector means that there will be a number of differences in the Green Deal for this sector, though the key principles set out in this Evidence apply to both businesses and households – the savings from taps and showers will be as detailed for households. Waterwise also has evidence of the costs and benefits of making toilets and urinals water-efficient. As for households, water companies could fund the cold water element of the Green Deal.

Consumer protection - prerequisites for all Green Deal plans

In this section Waterwise outlines potential models for ensuring the eight prerequisite consumer protections set out in the Call for Evidence are met. The prerequisites are listed below, with brief narrative relating to water efficiency measures where relevant:

1. The expected financial savings must be equal to or greater than the cost of repayment attached to the energy bill, known as "the Golden Rule" of the Green Deal.

Because water efficiency measures are relatively cheap when compared to insulation (far less than £100), their payback on household energy bills would be a maximum of three years, as is illustrated elsewhere in this Evidence.

2. The claimed bill savings must be verified.

Government-supported analysis of costs and benefits to underpin bill savings from water efficiency measures exists in Waterwise's Evidence Base (described on page 2). In the absence of a water meter in every home, this is currently the most reliable way of validating energy bill savings based on reduced water use. Further research is underway with water companies, and the Green Deal itself would provide new data to support further robust analysis. It is of course important for energy-only measures that verification be based on actual energy meter readings but the water savings will in more cases than not not be measured at household level: only a third of homes in England, a quarter in Wales and less than 1% in Scotland are currently metered for water. Therefore, the water savings element of the Green Deal bill payback should be based on actual field data, beyond a pure desk model, to ensure it is robust. Waterwise's Evidence Base, supported by Government, represents this.

3. The measures installed must have been recommended for that property by an accredited, objective adviser who has carried out an assessment.

Drawing on its experience in one of the largest retrofitting and behaviour change projects for water and energy (Tap into Savings), Waterwise could develop a training package for this, linked with existing skills accreditation such as NVQ and City and Guilds.

4. The measures must be installed by an accredited installer.

See response to 3.

5. For householders, the Green Deal provider must give appropriate advice within the terms of the Consumer Credit Act and take account of the individual circumstances of the applicant.

Not applicable.

6. The Green Deal provider must have consent from the relevant parties, including the express consent of the current energy bill-payer.

Not applicable.

7. The presence of a Green Deal must be properly disclosed to subsequent bill payers (e.g. new owners or tenants) alongside energy performance information.

Not applicable.

8. Energy suppliers must collect the Green Deal charge and pass it on within the existing regulatory safeguards for collecting energy bill payments – including protections for vulnerable consumers.

Potential models for ensuring these eight prerequisites are met, in the context of the inclusion of water efficiency in the Green Deal, are:

- The surveyor offers advice on water-efficient behaviour on the first visit, and a retrofit of showers and taps at either this visit (20 minutes) or the second, installer visit
- As above but a toilet retrofit is also included, funded at cost by the householder (£10 kit plus £10 installation) or by the water company through a link to the regulatory frameworks for water in England and Wales (Ofwat) and Scotland (Water Industry Commission for Scotland)
- Accredited training is provided by Waterwise to both the surveyor and the installer, on installation of measures to make showers and taps more water-efficient, and on behaviour change (the training taking half a day to one week, depending on existing skills levels)
- The water-efficient showerhead, with the same customer experience and performance as a non-water-efficient showerhead – and the other water-efficient products – is used as an incentive, at the surveyor visit (through the showing of samples), for the householder to take up the Green Deal
- If the household is already metered for water (one third of homes in England, a quarter in Wales and less than 1% in Scotland), the saving on water bills as well as energy bills is used as an incentive for the householder to take up the Green Deal

In addition, the Green Deal can be used as an incentive for householders to have a water meter installed by their water company.

Checklist of information and evidence

In this section Waterwise collates all the costs and benefits outlined and implicit in this submission, according to the template set out in the Call for Evidence.

1. Information about the product(s), system design and functionality;

Household energy savings through the reduction of hot water use

There are a number of products which can be retrofitted into a home in order to achieve energy savings through the reduction of hot water use. The key products in this area are:

<u>Low-Flow/Aerated Showerheads</u>

These are very popular and have been fitted in a large proportion of homes during retrofit projects Waterwise has run. They are generally easy to install and high carbon savings are attached to their use.

There are a number of different types of water-saving showerheads: some are reduced-flow, some are aerated and others have unique methods of reducing water consumption.

An aerated showerhead appears to deliver a higher flow than it actually does, providing the user with the experience of a power shower but with significantly less water.

Low-flow showerheads simply restrict the volume of water flowing through the showerhead: whilst previously it was thought that these did not provide the householder with a satisfactory shower, current design has mostly eradicated this issue.

All of these products will achieve reductions in residents' energy bills (and water bills, if metered) as the showerhead will help to save around thirty litres of water per day, and the energy savings will result from a reduction in hot water being used. Some models have antibacterial properties – an additional benefit which should be communicated to the householder.

Not all of these products can be installed with electric showers and monsoon showers, and aerated showerheads will not normally work on gravity-fed systems as they need a pressure of at least one bar to function correctly. Basic training would enable the surveyor/installer to advise the householder on suitability of installation.

<u>In-line aerators/flow-limiting devices for showers</u>

These are popular with householders who do not want a new showerhead which may not match their existing bathroom suite. They are screwed easily between the showerhead and the hose, to either reduce flow or introduce air into the water stream to give an aerated flow. They exhibit the same savings as those associated with the showerheads above, so do not affect the costs and benefits set out on pages 7 to 10 and in Annex 2.

<u>Tap aerators/flow-restrictors</u>

These work in a similar way to the in-line shower devices. Aerators restrict the flow of water from the tap without reducing water pressure. Fitting an aerator to the taps can reduce the amount of water used by more than 50% - about three washing up bowls of water a day - whilst creating a smoother water flow. Fitting them to the hot water tap results in a direct energy saving. Aerators come in a number of sizes and varying flow rates and are available to fit most taps.

Waterwise has found that tap aerators are well-liked by residents. A range of models need to be available in order to suit the variety of taps which can be found.

Water savings and Britain-wide energy savings

Whilst associated with cold water, and therefore not giving any household energy savings, toilet retrofit products can save a significant volume of household water and, for those householders on a water meter, deliver a marked reduction on their water bill. They also save carbon and energy at a GB level through reduced water company pumping and treating.

Toilet conversion kits

One third of the water used in the home is for flushing the toilet. Toilet conversion kits allow householders to convert their single-flush toilet into a dual-flush, saving around three buckets of water per day. One well-respected product in this area, which Waterwise and the water companies have used in thousands of homes, is the EcoBETA, which replaces the single-flush siphon in the toilet. In the Waterwise-led Tap into Savings partnership mentioned earlier, the EcoBETA proved very popular with residents. When the user holds the handle down it provides a full flush, but when the handle is released promptly, it provides a smaller flush, pre-set by the user. The ecoBETA insert could be adjusted to provide a single flush of 4 ½ litres which would be enough to dispose of all waste. The EcoBETA is easy to install, taking only five to ten minutes on most existing cistern water tanks. Other toilet retrofit products exist.

2. The total cost of professionally installing these energy efficiency measures for different types of property and locations;

Pages 7 to 10 and Annex 2 outline two scenarios for including water efficiency measures in the Green Deal. The costs of the products vary from £1 or less for the flow-restrictors/in-line aerators, to approximately £10 each for the showerhead and the toilet retrofit device.

Scenario 1

This scenario includes the retrofit of showers and taps.

Overall cost of water retrofit = £47.50

Scenario 2

This scenario includes the retrofit of showers, taps and toilets.

Overall cost of water retrofit = £67.50

3. The assumptions behind the costs including a detailed breakdown of the components, for example, materials, labour, other 'hidden costs' and "make good costs";

Scenario 1

This scenario, set out in the first spreadsheet in Annex 2, includes the retrofit of showers and taps only. This scenario was created specifically to feed into discussions on the Energy Bill and the Green Deal.

Overall payback can be calculated assuming water savings of 20 litres per property per day. This is based on the results achieved in a trial of 1000 homes included in Waterwise's Evidence Base (Anglian Water's Ipswich Trial), but an additional assumption based on the

contribution of showers and taps to the original savings of 41 litres per property per day (which included a toilet retrofit) has been made: essentially showers and taps are assumed to account for 50 per cent of the water savings. A three-year payback on energy bills will be achieved, at a cost per property of £50.

The water efficiency measures can in practice be delivered for even less than £50 per property including products and installation. Below is an example of the products which could be installed and a cost estimate based on recent procurement:

1 Mira Eco showerhead – approx £10 per unit
5 tap inserts per household - £2.50 per unit
1 digital shower timer - £5.00 per unit
Cost of products = £27.50

Installation time – 20 minutes @ cost of £60/hour = £20

Overall cost of water retrofit = £47.50

Scenario 2

This scenario includes the retrofit of showers, taps and toilets. The payback calculation for this scenario, set out in the second spreadsheet in Annex 2, takes into account the monetary benefit of water, energy and carbon emissions savings to calculate a net present value.

Overall, payback can be achieved within the third year on energy bills, and within the first year for homes metered for water and energy, assuming water savings of 41 litres per property per day, which were typically achieved in a trial of 1000 homes included in Waterwise's Evidence Base (Anglian Water's Ipswich Trial).

The water efficiency measures can in practice be delivered for less than £70 per property, including products and installation. Below is an example of the products which could be installed, and a cost estimate based on recent procurement:

1 dual-flush toilet conversion device per household – approx £10 per unit
1 Mira Eco showerhead – approx £10 per unit
5 tap inserts per household - £2.50 per unit
1 digital shower timer - £5.00 per unit
Cost of products = £37.50

Installation time – 30 minutes @ cost of £60/hour = £30

Overall cost of water retrofit = £67.50

Economies of scale would reduce costs.

4. Information on the average time taken to install measures. Potential innovations which aim to avoid or reduce disruption for the occupiers of the property;

Scenario 1

This scenario includes the retrofit of showers and taps only.
Installation time – 20 minutes.

Scenario 2

This scenario includes the retrofit of showers, taps and toilets.
Installation time – 30 minutes.

5. Evidence of how measure(s) or products perform in terms of energy efficiency, energy savings, and/or cash savings on energy bills, and any other benefits (against a stated counterfactual). Again, the assumptions should be set out where known, including assumptions on the type of property or energy source; whether the data is from "in-situ" trials or not, whether savings have been verified and how, and what assumptions are made about building occupants and their patterns of energy use;

The energy savings calculated here are derived from the Waterwise Water-Energy model which has been compared with the Energy Saving Trust Water-Energy Model and has been found to be equivalent. It has been used in Waterwise's Evidence Base, supported by actual retrofitting data, to calculate the paybacks detailed in this Evidence.

Scenario 1

This scenario includes the retrofit of showers and taps only.

Energy savings – 0.04 kWh per litre of water saved, which amounts to 300 kWh per household in the first year. It is assumed that gas is used to heat water in the home and an average price of £0.085 per kWh has been used. The household-level energy saving in the first year amounts to £26.

Scenario 2

This scenario includes the retrofit of showers, taps and toilets.

Energy savings – 0.02 kWh per litre of water saved, which amounts to 300 kWh in the first year. It is assumed that gas is used to heat water in the home and an average price of £0.085 per kWh has been used. The household-level energy saving in the first year amounts to £26.

The carbon and energy savings per litre for this scenario are lower than those for the scenario which does not include a toilet retrofit, because the household-level carbon and energy saving is spread over a higher water saving (the toilet retrofit does not deliver carbon and energy savings within the home). Absolute energy and carbon savings at household level are the same in both scenarios.

6. Whether the cost and performance calculations were carried out internally or by an accredited third-party;

The cost and performance calculations were carried out internally but are derived from Waterwise's Evidence Base for Large-scale Water Efficiency which is overseen by a Steering Group comprising DECC, Defra, DCLG, the Environment Agency, Ofwat and the Consumer Council for Water, as well as the water companies.

Defra, Ofwat, the Environment Agency and, until recently, DCLG, fund the Evidence Base, and it is accepted across the water sector as the definitive source of data and analysis of the costs and benefits of water efficiency measures. It was used by Ofwat and the water companies in the 2009 periodic review of water prices for England and Wales.

7. Other factors affecting the costs and performance of measures, for example, whether they are delivered at a community-scale;

The costs are well-defined. A factor that may affect the cost is the number of visits which can be carried out in a day. Up to 14 visits per day have been found to be possible.

The performance of measures depends to a great extent on individual behaviour. However the savings quoted in the paybacks set out in this Evidence are calculated from data from a group of over 6000 properties, and the quoted values represent mean figures.

There are a number of factors which are likely to boost take-up of water-efficient devices as well as satisfaction with them after installation. They do have costs (for example, it will take a little longer to install a showerhead if households have a demonstration of how it works beforehand) but they are also likely to have benefits (for example, households are more likely to agree to have a showerhead installed if they can try it beforehand; they are more likely to be happy with its performance and therefore keep it in; and they are more likely to tell their family and friends positive things about it).

Research shows that consumers are keen to ensure that any changes they make to their bathroom look good (so that new fittings should be of a similar style to the rest of the bathroom) and work well (enhancing or at least maintaining the performance of the fittings). Some of the following considerations do not apply to energy efficiency improvements:

a. It would be helpful for installers to show households how water-efficient showerheads work (for example by letting them put their hand under the flow) so that they can decide whether they are happy with them at the time of installation. This was requested by participants in focus groups to inform a retrofit trial[1].

b. It would be worth offering a choice of different showerheads and letting consumers try them to find the one they prefer. It is clear from several

[1] Rathouse, K and Clayton, K (2009) Focus groups on proposed retrofit trial. Unpublished report to Veolia Water.

studies that preferences differ[2]. It is also important that the look of the showerhead matches the existing bathroom so different styles should be offered.

c. Households should be shown how to remove and clean the device, should they need to at the time of installation. They should also be given a helpline number. Staff need to be trained to deal with queries which it is known arise about water-efficient devices, such as the fact that water from aerated taps may look cloudy[3].

8. The verified lifetime and replacement rate (theoretical and/or actual) of the measure(s);

A lifetime of ten years is assumed for efficient showers, tap inserts and toilet conversion kits.

9. Costs and benefits available for packages of measures (i.e. multiple measures). Specifically, how combinations of measures can reinforce energy efficiency and help to lower costs;

See responses to 2, 3 and 4 above.

10. The tools or methodologies used in calculations of performance and an indication of how robust they are, for example, the margin of error;

The methodology for the estimation of carbon and energy savings is explained in Chapter 5 of the February 2010 report of the Evidence Base for Large-scale Water Efficiency in Homes. The report can be found here.

11. The technical risks associated with installation or improper maintenance, evidence of the impact, and any steps being taken to address these.

The devices are very easy to install and do not generally require maintenance if fitted correctly.

Installing flow-restrictors or aerators into properties with a high limescale risk may cause limescale build-ups within the product, but this would occur in standard taps and showers. Advice on regular cleaning should be given to avoid this.

12. Evidence relating to technical problems that may need solving in the building prior to or during installation of measures (such as dealing with damp or asbestos) and the costs involved;

Not applicable.

[2] Numerous reports including BNWATSH01: Consumer views about showers - summary report. Report to Market Transformation Programme.
[3] Tap into Savings focus groups

13. Any measures that are not listed here but should be considered because they have the potential to save money on fuel bills. Related information on costs and performance;

Not applicable.

14. References to existing general analyses or independent reports available relating to costs and performance of measures;

The Evidence Base for Large-scale Water Efficiency Project, Phase II interim report, February 2010. Available here.

The updated report will be available at www.waterwise.org.uk from mid-April 2011.

15. A brief synopsis of any relevant ongoing (and proposed) research on measures and retrofitting for energy efficiency, and when the findings will be available;

Tap into Savings is a Waterwise-led retrofitting and behaviour change partnership for water and energy efficiency in 7,500 homes in England. It is part-funded by Defra's Greener Living Fund. It was a two-year programme which concluded on 31st March 2011. There was a heavy emphasis on evaluation in the programme, and data and analysis will be available in June 2011.

16. Any known gaps in information.

More information on the impacts of different interventions to nudge behaviour change would be welcome, in particular on showering behaviour.

Nicci Russell
Waterwise Policy Director

Waterwise is an independent, not-for-profit, non-governmental organisation focused on decreasing water consumption in the UK and building the evidence base for large scale water efficiency. We are the leading authority on water efficiency in the UK. Our aim is to reverse the upward trend in how much water we all use at home and at work. For more information please visit www.waterwise.org.uk